The Occupational Composition of Employment of Mexicans and Wages of African-American Workers

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Abstract

This paper examines the impact of Mexican immigration on the wages of African-American workers of different skill/educational levels, using an instrumental variable approach. Recognizing that Mexican immigrants and African-Americans work in particular distinct occupations, we use this fact to motivate the empirical strategy to identify the effect of Mexican immigration on the wages of African-American workers, exploiting variations in occupations. We find that Mexican immigrants are more highly concentrated in certain occupations requiring less education. Consequently, Mexicans' presence in those occupations, correspond to lower wages for African-Americans, in the order of 3 percent for high school graduates, respectively. By contrast, Mexican immigrants' presence in occupations in which we find African-Americans with a college education or higher is relatively low. The lack of presence of Mexican immigrants in those occupations corresponds to 12 percent higher wages for these more skilled/educated African-Americans.

INTRODUCTION AND OVERVIEW

During the 1990s, the number of Mexican immigrants living in the U.S. rose by more than five million. By the 2000 Census, Mexican immigrants made up more than 4 percent of the working-age population, close to twice the proportion a decade earlier. By 2003, Mexican immigrants to the U.S. accounted for 28.3 percent of all foreign-born inhabitants of the country. Mexican immigrants constitute a sizable and growing segment of the U.S. labor force, accounting for over 1 million of 2.5 million new jobs created in 2004 (Kochhar, 2005).

At the same time, a salient feature of the Mexican immigrant labor force is its high degree of occupational clustering in low-waged and less-skilled occupations (i.e., in terms of educational requirements). In 2003, recent Mexican immigrants who had arrived in the previous five years constituted 1 to 5 percent of the labor force in their metropolitan receiving areas, yet they made up to 29 percent of workers in certain occupations (Catanzarite, 2003). Over the 1990s and 2000s, Mexicans experienced strong gains in the (low-waged) service sector, including food preparation and serving, cleaning and personal care, as well as in production, extraction and farming occupations, while native-born workers' participation either declined or remained relatively low in those occupations (Toussaint-Comeau et al., 2005).

The concentration of Mexican immigrants in certain occupations/industries has catalyzed a research and policy debate about whether they substitute for native-born workers in production. Does their concentration in these occupations lead to pressures in wages experienced by low-skilled workers—particularly black workers? Or, are Mexicans filling jobs that are not necessarily chosen by natives, or were not at least during the prosperous 1990s? The size of the Mexican labor force and its potential role in affecting the overall wage structure suggest that it is important to have a better understanding of the nature of the relation between Mexican immigrant workers and labor market outcomes of their native-born counterparts.

The increase in Mexican immigrants in the labor force coincides with several specific trends in the labor market experiences of African-Americans, which raises questions regarding its impact on this group in particular. Whereas Mexican immigrants had tended to be concentrated in relatively few cities, over the 1990s, they became increasingly dispersed, moving to cities like Atlanta that have traditionally had a large African-American population (Card, 2005). In 2000, the employment rate of African-American men (fraction of weeks worked during

a year) fell to 67.9 percent compared with 74.9 percent in 1960 (Borjas, Grogger, and Hanson, 2008). Wages of African-Americans, which had been trended toward converging with those of whites in the 1960s and the 1970s, stalled beginning in the 1980s (Amitabh, 2000).

A number of studies have been concerned with examining the effects of immigration on African-Americans, guided by the notion that immigration would presumably affect this group in particular (e.g., Altonji and Card, 1991; LaLonde and Topel, 1991; Borjas et al., 2008). These studies have found small or negligible effects. By contrast, Borjas, Grogger, and Hanson (2006) analyzed the effect of immigrants on African-Americans and found that as a disproportionate number of immigrants increase the supply of workers in some skill categories, the wages of black workers tend to fall, by up to 4 percent for the low-skilled. Some studies have been concerned with the specific impact of Mexican immigration. Borjas and Katz (2005) find that Mexican immigration lowers wages of native high school drop outs by 4 percent to 8 percent.

These previous studies have looked at either the effect of Mexicans on natives in general or the effect of immigration in general on African-Americans. In this paper, I focus on two groups—Mexican immigrants and African-Americans.

I examine a much less researched aspect of the wage determination process—the role of occupational clustering or segregation and ethnic/language networks in the wage determination process of a native minority worker group. Starting with the underlying notion that Mexicans and African-Americans may not be doing the same jobs, we ask whether the tendency to be "specialized" or segregated in distinct occupations with certain characteristics (manual relative to language/interaction tasks) mitigates the effect of Mexicans on wages of African-Americans. The methodological approach of this paper consists of conducting an empirical analysis of occupational wage determination where I compare Ordinary Least Square (OLS) models and 2-

Stage Instrumental Variable (IV) models in an attempt to correct for endogeneity of occupational composition. I also innovate in this paper with my use of two instruments that proxy for ethnic networks and ethnic language skill networks *effects* that I believe influence the choice of occupations, but not future wages.

We make use of data from the Public Use Micro Statistics (PUMS), 5% sample from the U.S. Census, which allows us to exploit variations across more than 400 detailed occupation/ categories (as opposed to geography) to identify the effect of Mexicans. We find that consistent with previous research, there is an inverse relationship between an increase in Mexican immigrants in an occupation and wages of African-Americans in that occupation, suggestive of a potential for a crowding out or substitution effect. We find that Mexican immigrants are more highly concentrated in occupations in which we also find African-Americans who are not highly educated. Consequently, Mexicans' presence in those occupations corresponds to lower wages for African-Americans in the order of 0.5 percent to 3 percent for high school drop outs and high school graduates, respectively. By contrast, Mexican immigrants' presence in occupation in which we find African-Americans with more education is relatively low. The *lack of presence* of Mexican immigrants in those occupations corresponds to 12 percent higher wages for more skilled/educated African-Americans, with a college education or more.

The remainder of the paper is organized as follows: The next section provides a brief review of two strings of literature—a mostly sociology literature that explains the process of immigrant/ethnic clustering in distinct occupations, as driven by ethnic/language networks; and an economic literature that analyzes the effect of immigrants on wages of natives. Section 3 provides a simple framework of the labor market effect of immigrants on natives, which the analysis is based on and which makes clear the hypothesis we are testing. Section 4 describes the

estimation procedure for the empirical analysis. The penultimate section presents the data and the results of the empirical analysis. The final section summarizes the paper and discusses the policy implications of the findings.

PREVIOUS LITERATURE AND THEORETICAL BACKGROUND

Emergence of Occupational Clustering

There is agreement that occupation segregation is present, but there is no single explanation as to its causes. The clustering of immigrants in distinct locations and occupations has risen from a host of circumstances. Immigrants concentrate in distinctive locations which were historically traditional ports of entries in the U.S--reinforced by family-reunification based immigration policy. A large literature (from the sociology field, especially) speaks of the tendency by immigrants to concentrate spatially in neighborhoods or *ethnic enclaves* and to develop ethnic economies that take advantage of ethnic network capital. This literature provides insights into the process of "ethnic niche" formation, which suggests how immigrants become concentrated in certain occupation niches. Ethnic occupation niches can arise from practices of recruitment of new workers through the networks of current workers (Park, 2004; Mouw, 2003; Waldinger and Der-Martirosian, 2001; Gallo and Bailey, 1996). For example, the concentration of Mexicans in farming is partly a result of practices of recruitment of workers from the migrant labor pool and immigration policy (e.g., the Bracero Program; Betancur and Torres, 1993). It can also arise from the process of "ethnic succession" in the job market. This process can be partly a result of the dynamics of "residential segregation," whereby natives exit certain sectors as immigrants enter them, a phenomenon that has been documented in New York City between whites and Cubans (Waldinger, 1996; Wright and Elllis, 1996).

Occupations tend to be heterogeneous in their use of language. Hellerstein and Neumark (2004) find that occupations are strongly segregated along the line of language ability, and that segregation by language explains one third of Hispanic-white segregation in the workplace. Occupational segregation by immigrants is reinforced with a common language and shared information about employment opportunities through ethnic networks. This is evidenced by the fact that some immigrants tend to cluster in relatively few occupations. For example, in occupations that have traditionally been held by immigrants, employers are less likely to screen out those who have a lack of English knowledge (Kossouji, 1998). According to the sociological perspective, occupational segregation, if pronounced, can result to a type of "segmented" labor market, whereby native workers could be insulated from a direct impact of immigrants. Hammermesh (1993) find that the cross-elasticity between immigrants and natives (the degree of complementarity or substitution between immigrants in a set of occupations and natives in another) is very small, suggesting that the labor market may be divided along sectors defined by immigrant status/language skills.

Impact of Immigrants on Wages of Natives

Economic theory also provides some explanations for occupational segregation and its potential effect on wages. A group may be disproportionately in occupations with low earnings due to market discrimination or due to a self-sorting mechanism (as may be the case for women with children). Either way, if employers exclude a group from better paying occupations or if the group self-selects into low-paying occupations, then the group would be crowded in low-paying occupations, further compressing wages in those occupations.

A large economic literature provides a formal theoretical model on the relationship

between an increase in immigrant population and the wages of natives (e.g., Borjas, 1999; Greenwood and Hunt 1995; Johnson, 1998; Ottavano and Peri, 2005, Chiswick et al.). The basic tenet is that assuming constant capital and constant returns to scale production technology and perfect substitution between immigrants and natives, an increase in the supply of immigrants is expected to depress wages for natives. The degree to which natives and immigrants are substitutes for one another depends on their relative occupations or skill profiles. Substitution between immigrants and natives may be higher in low-skilled occupations than in high-skilled occupations. This could be due to the fact that low-skilled occupations are more likely to have lower training costs and require less institutional knowledge, while high-skilled professional occupations, in the health and legal fields, for instance, require licensing and have other entry barriers; this lowers the degree of transferability of the skills immigrants acquired in their country of origin (Friedberg, 2000; Duleep and Regets, 2002; Gallo and Bailey, 1996). These theories predict that there will be greater occupational clustering or segregation of immigrants in very low-skilled occupations.

If immigrants and native workers are not substitutes for each other, but rather are complements in production, then an increase in immigrants' inflow into the labor market could raise the wages of native workers, especially as the latter reallocate into areas or sectors with higher wages, or the natives take on jobs that are more managerial or administrative, which pay more (e.g., Greenwood and Hunt 1995; Johnson, 1998; Ottavano and Peri, 2005; Chiswick et al., 1992).

The effect of immigrants on natives may also be mitigated if natives are mobile either because they move out of places where immigrants are concentrated (Frey, 1995), or they adjust their human capital and change occupations in the long term (Chiswick, 1989). Indeed, there is

no consensus as to whether natives are mobile and respond to an influx of immigrants by moving to other areas (Card, 2001; Kritz and Gurak, 2001).

It has been shown that immigrants tend to adjust their human capital. The longer immigrants live in the U.S., depending on the incentives they have and their efficiency in investing in U.S.-specific human capital, the more institutional knowledge and language capital they acquire (Chiswick and Miller, 1995). As a result, immigrants become more competitive with natives for jobs over time. Findings that immigrants experience a wage penalty when they first come to the U.S. and subsequently experience faster growth in their earnings are consistent with this "assimilation" perspective (Duleep and Regets, 2002). This suggests that ultimately the effect of immigration on natives' wages is a long-run phenomenon.

On the factor demand side, previous studies suggest that immigration can induce changes in production and industry structures that cushion its impact on natives' wages. For example, firms may absorb an increase in the supply of immigrants and adapt their technology to the local supply of different types of labor. Or, immigration can cause a change in the output mix of the local labor market, with labor-intensive industries expanding or moving to areas with large numbers of immigrants. Previous studies have found evidence of upward pressures on wages as a result of firms increasing their scale of production (and raising their demand in factor labor) to meet the increased demand for outputs by new immigrants (Altonji and Card, 1991).

Moreover, immigrants can add to the capital stock by bringing savings when they migrate as well as over time after their migration. In response to an immigrant influx, capital may also move across industries and areas, since unskilled labor may be more likely to serve as a substitute for capital (Hammermesh, 1993). Since capital tends to be a complement to skilled labor and a substitute for unskilled labor, natives' wages in the skilled sectors would likely rise

as a result of an influx of low-skilled immigrants.[1]

The results of previous empirical studies on the impact of immigration have been mixed and have tended to depend on the methodological approach taken. A few studies have used natural experiments to isolate the effect of an influx of immigration on natives (i.e., Mariel Boatlifts). This approach has yielded no significant impact of immigration on wages of natives (e.g., Card 1990; Hunt 1992; Carrington and DeLima, 1996). Data based on random experiments are difficult to come by, limiting the use of this approach.

Several studies have exploited variations across geographies to estimate changes in the labor market outcomes of natives. They have found either no sizable effect of immigration on natives, or a very small positive effect, suggesting that there may be limited substitution between immigrants and natives in immigrant-receiving metropolitan areas (Altonji and Card, 1991; Butcher and Card, 1991; LaLonde and Topel, 1991; Schoeni, 1997; Card, 2005). This approach is criticized because of labor mobility--the effect of immigrants on natives could be mitigated if labor is mobile and moves to other areas in response to an influx of immigrants (Card, 2001; Kritz and Gurak, 2001; Frey, 1995).[2]

A few studies have taken a factor proportion approach to estimate the changes in the supply of different skill groups. For example, Borjas et al. (1992) use "skills" as an identification strategy defined by age/education/experience cell groups to assess the impact of

[1] The empirical analysis of this study (due to data limitations) does not control for capital, a factor that may be important in determining the impact of immigrants on natives over time. The cross-sectional nature of the data also does not allow me to control for endogenous shifts in labor supply over time.

[2] If factors of production are perfectly mobile, there will be tend to be no local effects of immigration—these effects would be entirely mediated through general equilibrium impacts on the larger market. This follows from trade theory; if economies are perfectly integrated, then local quantities are unrelated to local prices—the law of one world price for all factors will prevail. In other words, if one assumes that there is perfect factor price equalization, (FPE) and no international factor price equalization, this means that immigration can affect aggregate wages but not relative wages across areas within a country.

immigrants on natives with similar skills. This approach has yielded significantly larger (negative) effects of immigrants on natives. For example, as mentioned, Borjas and Katz (2005) analyzed the impacts of Mexican immigrants and find that Mexican immigration lowers wages of native high-school drop outs by 4% to 8%. Orrenius and Zavodny (2006) also use occupational variations in their study, and they find a negative impact on wages and employment of natives in low-skilled and low-wage occupations. The approach of this paper will be similar in spirit to the factor proportion approach.

We will also draw from the recent research that has brought attention to the phenomenon of "task specialization." With task specialization, some immigrants and natives may not be competing for similar jobs. Peri and Sparber, (2008) provides a formal model in which low-skilled natives reallocate their labor by specializing into jobs that are intensive in "interactive production tasks" as opposed to "manual tasks" in which immigrants specialize. They show that "task specialization" by immigrants causes natives with similar education to reallocate their own task supply into jobs requiring more interactive and communication skills. They show that as a result of increased specialization of immigrants, downward pressure on wages for less-educated natives has been reduced in states with large immigration flows. This paper asks a similar question regarding the impact of Mexican immigrants on wages of African-Americans. Of immediate interest will also be whether task specialization mitigates such an impact.

A SIMPLE MODEL OF NATIVES' OCCUPATION WAGE DETERMINATION WITH IMMIGRATION

The basic question that we are testing is whether the presence of Mexican immigrants lower wages for African-Americans and the extent to which task specialization may mitigate this

effect. We use a factor proportion approach using variations in occupations and considering various skill/education/occupational groupings (Borjas and Katz, 2005; Cantazarite et al, 2006; Friedberg, 2001). Recognizing that Mexican immigrants and African-Americans disproportionately work in distinct occupations, we use this fact to motivate the empirical strategy for identification, exploiting variations in the inflows of occupations across time to test the effect of Mexicans on wages of African-Americans. The key assumption is, given occupation-specific human capital, it might be harder to change occupations (compared with changing location). This would reduce the speed at which workers respond to changes in wages in occupations at least in the short run, creating a more persistent disequilibrium across occupations, from which to gauge a potential effect of immigrants (Friedberg, 2001).

To make clear the point that we are testing, it is useful to sketch out a simple model of labor market with immigration. Following Friedberg (2001), we assume a labor market in a closed economy over a 2-period, t (0 and 1), with K occupations, indexed by k. Native workers are employed in occupation k at time t, denoted by N_{kt}. We are supposing that immigration occurs between the two periods for simplicity. Employment of immigrants in occupation k is denoted by I_{kt}. Total employment in any given occupation E_{kt}, is equal to $N_{kt} + I_{kt}$. The ratio of immigrants to native workers, r_{kt}, is equal to I_{kt}/N_{kt}.

Assuming that the labor market has a constant elasticity of demand function as follows:

$$Ln(E_{kt}) = \ln (D_k) + \eta \ln(W_{kt}),$$

where D_k is a demand curve parameter that shifts the demand function (i.e., some occupations have higher demand for employment than others, for example, a nurse may be in higher demand than a dancer). Assume that the labor market is in equilibrium in period 0, such that wages are equalized across all occupations, with $W_{k0} = W_0$ for all k. By definition in period 0, total

employment E_{k0} is equal to N_{k0}. The labor market equilibrium in period 0 is given by:

$$Ln(N_{k0}) = \ln(D_k) + \eta \ln(W_{k0}).$$

In period 1, which includes immigration, labor market equilibrium is given by:

$$Ln(N_{k0} + I_{k1})) = \ln(D_k) + \eta \ln(W_{k1}).$$

Again, we note that in this short-run framework, workers do not change occupations easily in response to a change in relative wages, since it is costly to obtain additional occupation-specific human capital (Friedberg, 2001). In other words, labor market re-equilibration occurs slowly. Hence, total native employment in those occupations remains the same over that period ($N_{k0} = N_{k1} = N_k$). Then, substituting (2) into (3) and rearranging the terms yields the following:

$$Ln\ (W_{k1}) \approx \text{constant} + (1/\ \eta)\ r_{k1}.$$

This simple labor market model yields the result that the presence of immigrants in occupation k is inversely associated with wages of natives in occupation k.

ESTIMATION METHODOLOGY

The OLS Model

To test the effect of an increase in the labor supply of Mexican immigrants in an occupation on the wages of African-American workers in that occupation, we consider a native's individual-level earning function: The individual earning function, as opposed to the average wages approach, allows me to control for factors that impact the individual's wages, such as secular changes in the returns to workers' education experienced by individuals, as well as other life-cycle characteristics, in addition to immigration inflow and related immigration factors.[3] This individual earnings function is specified as follows:

[3] Using individual-level data has the advantage of added efficiency, relative to an analysis of mean occupational data, which might be more inclined to suffer omitted variable bias.

$$Lnw_{ikt} = \alpha + \beta_i X_{it} + \gamma_{ik} r_{ikt} + \varepsilon_{it},$$

where w_{ikt} is the log of hourly earnings of the native individual i in occupation k at time t. α is the constant term. X_{it} is a vector of control variables (which include schooling level, labor market experience, marital status, and state location fixed effect dummy variables). ε_{it} is an individual-specific disturbance term, capturing the effect of unobservable variables that vary across individuals in each occupation, assumed to be normally distributed with mean zero and a homoscedastic variance. The main variable of interest is of course, r_{ikt}, which indicates the ratio of immigrant workers to native workers in the native individuals' occupation k at time t. In this OLS framework, the assumption is that the distribution of immigrants and native workers across occupations, r_{ikt}, is exogenous to wages,

where $r_{ikt} =$ $\dfrac{\text{}}{\text{}}$.

The Two-Stage Instrumental Variable Model

In practice, the variable r_{ikt} indicating the ratio of immigrant workers to native workers in the occupation could be correlated with the error term ε_{it} in the wage equation. If such is the case, then the estimate γ_{ik} would be biased. This can be the case if, for example, Mexicans or

African-Americans with lower *unmeasured* skills sort into occupations with lower skills. We therefore relax the assumption of exogeneity and conduct a 2-stage estimation procedure.

The two-stage regression method technique allows me to break the variable r_{ikt} into two components—the part of r_{ikt} that is correlated with the error term and the part that is uncorrelated with the error. In the first stage, r_{ikt} is on the left-hand side of the equation (the predicted variable), and some instrumental variables are the predictors. If those predictors are not correlated with the error term in the first-stage regression, then the component of r_{ikt} that is related to the predictors will also be uncorrelated with the error term. The second stage uses the predicted values from the first-stage regression (with the error component now removed) as an instrument in the second stage regression to get unbiased estimates of γ_{ik} in the wage regression. This is expressed as follows:

$$r_{ikt} = \pi_0 + \pi_1 \text{ instrument1} + \pi_2 \text{ instrument2} + \ldots + \upsilon_{it}. \quad (1)$$

$$Lnw_{ikt} = \alpha + \beta_i X_{it} + \gamma_{ik} r_{ikt}' + \varepsilon_{it}. \quad (2)$$

We rely on the previous literature of ethnic networks to derive some testable instruments to explain occupation choice. As mentioned, studies in multidisciplinary fields have explored the phenomenon of how certain immigrant, ethnic, or minority groups become occupationally clustered and develop "occupational niches." This literature suggests that "new" Mexican immigrants (at least in the short run before they invest in additional host-country-specific human capital or language skills) are likely to take jobs where previous cohorts have established a self-reinforcing niche.

The economic theory of occupational choice also suggests that workers tend to choose

occupations according to their relative comparative advantage, given the tasks performed in those occupations (Roy, 1951; Autor et al., 2003). Data reveal that in fact there has been persistence in the occupational distribution profile of Mexican immigrants over time in the U.S. Following these theories, we can assume that such persistence reveals something about preferences or comparative advantage of the group in certain occupations, perhaps driven by ethnic networks, which is more or less independent of unobserved determinants of future wages of natives in the US.

In the first stage, we use information on the past occupation density of Mexicans (in 1990 using 1990 Census data) as an indicator of ethnic networks to explain the contemporaneous occupation density (in 2000 using 2000 Census data). The choice of lagged occupation density as an instrument for later occupation density is consistent with previous empirical economic studies that use historical immigrant allocation patterns in industries or historical spatial concentration patterns as instruments (e.g., Lewis, 2003; Card and Lewis, 2005). We note however that while using lags as an instrument is pretty common in the economic literature (and other literatures), serial correlation in the measures makes it such that the endogeneity issue may not be fully solved.

$$r_{ikt-1} = \quad .$$

We consider an additional relevant instrument based on the task intensity (i.e., manual vs. language) in the occupations. As mentioned, the literature suggests that language communication skills and information flows are also an important part of the story of occupational choice of

immigrants. Occupational clustering in certain occupations is reinforced as immigrants share information, often in a common language about employment opportunities through self-reinforcing ethnic networks. In the context of the specific immigrant group under consideration in this paper, waves of Mexicans migration into the U.S. contain large numbers of individuals who are relatively low levels of education and who do not speak English. We expect therefore that "new" Mexican immigrant workers are likely to have a comparative disadvantage when the English language skill requirement in an occupation is high. Even if natives can do the manual work, they may not choose to do it if they have a relative comparative advantage in occupations with more language/communicative tasks.

We make use of information on the task intensity of occupations to derive the instrument, capturing ethnic skill networks. Autor, Levy, and Murmane (ALM, 2003) developed a measure of the task intensity index for each occupation. As explained by ALM, the source of the task index comes from the Dictionary of Occupational Titles (DOT) that periodically evaluates the tasks required for more than 12,000 detailed occupations. ALM merged this information with the Census Occupation Codes and organized the occupations into five categories: (1) manual skills-eye, hand, and foot coordination (EHF); (2) finger dexterity (FINGER); (3) direction, control, and planning (DCP); (4) general education math (MATH); and (5) sets limits and tolerance (STS). EHF entails the "ability to move the hand and foot coordinately with each other and in accordance with visual stimuli." This variable gets a high value in occupations that demand physical precision. FINGER gets high values if the job requires intensive use of finger and hand dexterity (such as a truck driver). Occupations in management/white collar get low values for this variable. DCP can be viewed as a proxy for communication skills (Peri and Sparber, 2008). This variable measures a broad notion of an occupation's language interactive skill content.

ALM described this variable as one that represents occupations in which individuals possess "adaptability to accepting responsibility for the direction, control, or planning of people and activities." Occupations in management where individuals exhibit non-routine language and interpersonal communication skills get high values for DCP and low values for FINGER, whereas blue color/laborer occupations get low values for DCP and high values for FINGER and EHF. The two others (MATH, STS) relate more specifically to cognitive skills or intellectual skills (therefore we do not make use of them in this paper).

Hence, using ALM's 5 values for each occupation, we define a variable, TASK. We calculate TASK as the relative value of manual skills to communication skills for each occupation (the sum of EHF and FINGER over DCP).

Admittedly, the tasks involved in an occupation could be correlated with the error term in the wage equation. For example, manual jobs, which Mexican immigrants may specialize in and be willing to take, may be rewarded differently in the market. That is, they may be in such demand that the market is willing to reward these occupations more. By contrast, communicative jobs such as receptionist or civil servant services, which African-Americans may have a comparative advantage in doing because they are fluent in English, may get rewarded less (Catanzarite, 2003).

We consider a two-step strategy to gauge the characteristics of TASK that explain Mexicans' and African-Americans' density in an occupation, but that is devoid of compensating wage differentials. We do so by regressing the TASK variable on wage and then obtaining a fitted value of the residuals of the regression. We retain the fitted value for the residuals, TASK_FITTED, from the TASK-wage regression. The variable, TASK_FITTED, we submit, isolates the Mexican-specific compositional factor that is due to the task content of the

occupation and purges the occupation estimates of demand-related or wage compensating differences associated with the occupation. TASK_FITTED can be interpreted as capturing *unobservable* variations in a group's occupation due to supply shocks, such as ethnic/language/Mexican transferable skill network effects on occupation concentration. We use TASK_FITTED as a second instrument in the occupation model (1) in the first stage.

We summarize the steps we take (with all the variables as defined above), as follows:

TASK = wage + error term

Predict residuals = TASK_FITTED

$$r_{ikt} = \pi_0 + \pi_1 r_{ikt-1} + \pi_2 \text{ TASK\_FITTED} + \upsilon_{it} \quad (4)$$

$$Lnw_{ikt} = \alpha + \beta_i X_{it} + \gamma_{ik} r_{ikt}' + \varepsilon_{it}. \quad (5)$$

RESULTS

Data and Descriptive Statistics

We make use of the 1990 and 2000 Public Use Micro Statistics (PUMS) 5% sample data from the U.S Census. Pulling the last 2 most recent decennial censuses data, (the 1990 and 2000 datasets), allows us to exploit variations in the inflow of Mexican workers into an occupation across time during the period. The primary advantages of using these data files are sample size and occupation coverage.

Using cross-section occupational data over different datasets over time can presented a challenge because of changes in occupation classifications. We circumvent this problem by using

data with occupation crosswalks.[4] Undercounting of Mexicans due to the undocumented could also potentially be a drawback in these data, and still remain somewhat of a limitation.[5]

The sample used for the empirical analysis consists of U.S.-born individuals who identify themselves as blacks (we denote them as African-Americans) and people who identify themselves as having been born in Mexico, who are males, 18 to 64 years of age, with positive earnings, who live in a metropolitan area, who are not self-employed, and who are in not in the military.

Table 1 summarizes the average values of selected variables for Mexican immigrants and African-Americans in the sample, not holding anything constant. Mexican immigrants tend to have lower wages than African-Americans and have also completed less schooling. In fact, over 50 percent of Mexicans do not have a high school diploma and over a quarter among them do not speak English well. By contrast, only 20 percent of African-Americans do not have a high school diploma.

Table 1 also reports the corresponding observed wage ratio by 1-digit occupation group, measured as the ratio of Mexicans' average wages to the average wages of African-Americans.

[4] There have been significant changes in the classification of occupations between the 1990 and 2000 Censuses that warrant careful attention when making comparisons. The 1990 Census occupational codes are based on the 1980 Standard Occupational Classification (SOC) system in which occupations are organized hierarchically in terms of the skill level and the experience considered necessary for individuals engaged in the occupations. By contrast, the 2000 Census occupational codes are based on the 1998 SOC, which classifies occupations by 'job families'—job families combine occupations where people involved work together regardless of their respective skill level (i.e., doctors, nurses, and nurse assistants are grouped together). In addition, the 1998 SOC has more professional and technical occupations due to advances in technology and shifts in service-oriented sectors of the economy. Some 1990 occupations have become obsolete and do not figure in the 1998 SOC. In addition, some occupations have been "upgraded" or "downgraded." For example, farm, ranch and other agricultural managers are found in the major groups of management occupations in the 2000 Census whereas in 1990 they were listed under farming occupations. Without ensuring that occupational categories across Censuses are comparable, it is impossible to get an accurate measure involving change in the occupational classifications over the period. Peter B. Meyer and Anastasiya Osborne of BLS converted Census occupation codes from 1970, 1980, 1990 and 2000 to 1990 scheme, available at the University of Minnesota "IPUMS Project" (ipums@pop.umn.edu). This data set is used in the empirical analysis.

[5] As noted in Card and Lewis (2005): Calculations by Borjas, Freeman, and Lang (1991) suggest that the 1980 Census missed approximately 40 percent of unauthorized Mexican immigrants, leading to a 25% undercount in the overall Mexican immigrant population. Van Hook and Bean (1998) estimate a 30% undercount rate of unauthorized Mexicans in the 1990 Census and a 20% undercount of all Mexicans. Norwood et al (2004) suggest that the 2000 Census was substantially more successful in counting unauthorized immigrants. They estimated an undercount rate for unauthorized immigrants on the order of 10 percent, implying an undercount of total Mexican immigrants of 6-8%.

In very low-skill occupations (in terms of average educational requirement) such as farming and agriculture occupations, service, production, and construction, Mexicans earn much less for each dollar earned by African-Americans. However, in higher-skill occupations, such as sales and office occupations and professional occupations, Mexicans earn somewhat equal to or more than African-Americans.

In Table 2, we report the percentage of Mexican immigrants and African-American workers in 23 major occupation groupings. The occupation groupings are reported by decreasing order of socioeconomic status.[6] The corresponding average score of the task intensity index developed by Autor, Levy, and Murmane (ALM, 2003) is also reported in the table. As mentioned, this score is a composite index that ranges from 0 to 10, where the lower numbers mean a lesser value of the task measure. Each detailed occupation gets an index value for each task indication (EHF, FINGER, DCP, MATH, STS). Recall that EHF relates to "manual skills--eye, hand, and foot coordination"; FINGER is "finger dexterity"; DCP is "direction, control, and planning"; MATH is "general education math"; and STS is "sets limits and tolerance".

We report here the calculated average value of TASK, manual to communication task, for each occupation in each 2-digit grouping. Note that we consider only the scores that purport to manual vs. language interaction. That is, we take the sum of EHF and FINGER over DCP. (We do not use MATH and STS, as they relate more to intelligence and cognitive skills, which are not relevant for our purpose).

The results in Table 2 show that Mexican immigrants are more concentrated in food

[6] To proxy the socioeconomic status of a job, we compute a composite index of human capital requirement to assess the quantitative meaning (in terms of relative wages and skill level) of each occupation. This composite index is adapted from the methodology of Sicherman and Galor (1990), whereby we derive a score or an ordinal scale from regression analyses of wages and the human capital requirements of the job. Ranging from 0 to 100, the scores represent the human capital standing of a particular occupation in the universe of detailed occupations of all individuals in the labor force. The average score across all 475 occupations reported in the Census is 34.8. (Non-Hispanic white males have an average score of 37).

preparation and serving and building and grounds cleaning in farming, fishing, and forestry; in construction and extraction; production; and transportation and material moving occupations. We note that these occupations have relatively higher manual to communication task intensity. African-Americans have relatively higher representation in professional occupations, in protective services, and in office administration. We note that the occupations in which African-Americans are concentrated in have relatively lower manual to communication task intensity.

Empirical Results

We begin the empirical analysis by reporting in Table 3 the results from the first-stage OLS regressions of occupation. The coefficient estimates of lagged Mexican occupation concentration show what is implied by the labor supply of Mexicans from a previous decade. The positive relationship signals that the composition of the flow of Mexican immigrants into an occupation has tended to be more or less homogenous over time.

The coefficient estimate of TASK_FITTED is negative for the pooled sample of African-Americans and for subsamples of African-Americans with less skill (high school graduates and less). Recall that this measure is our proxy for capturing *unobservable* variations in a group's occupation due to supply shocks, such as ethnic skill/occupational networks. The negative coefficient suggests that such *unobservable* factors reinforce occupation divergence between Mexicans and African-Americans workers. This does not hold for the subsample of African-American with a college education/degree.

We also report in Table 3 F-statistics that test for the relevance and validity of the instruments. The F-statistics tests assess whether the coefficients on both instruments π_1 and π_2 are zero or not. An F-statistic that is greater than 10 indicates that the instrument is relevant. As

per the F-statistics reported in Table 3, we note that the proposed instruments are highly relevant for the most part. One exception, for the subsample of African-Americans with college education or college degree, lag Mexican occupation concentration is not highly relevant.

Table 4 reports the main results of the impact of the presence of Mexican immigrants in an occupation on wages of African-Americans in that occupation. We report both the OLS and the IV estimates of the log of hourly earnings for the pooled sample of African-Americans and for subsamples of African-Americans by education level. For the IV estimates, we do the wage regressions using both instruments simultaneously, which we report in Column (2). Then, we do the wage regression using each separately; in Column (3) we use the lag occupation instrument variable; and in Column (4), we use the TASK instrument variable.

The coefficient estimates of the OLS model are negative for the pooled sample, as well as for each education grouping. Both the OLS and IV estimates yield a negative and significant correlation between the presence of Mexicans in the African-American individual's occupation and wages for a pooled sample of Mexicans and African-Americans. For the pooled sample, the IV estimate is in fact more negative than the OLS baseline model estimate. The difference between the OLS and the IV estimates suggests that the distribution of Mexican immigrants and African-American workers across occupations is not independent of the unobserved determinants of wages in those occupations.

We note that whether the IV estimate effect in the pooled sample is statistically significant or not depends on which instrument is used. Using lag occupation ratio (in Column (3)), the presence of Mexican immigrants in an occupation does not have a statistically significant impact on wages of African-Americans in those occupations. However, when we use TASK_fitted (in Column (4)), which is the instrument that we argue is trying to capture some

supply shocks associated with ethnic skill/network effects, the presence of Mexican immigrants is associated with lower wages for African-Americans. This suggests that such unobserved factors, such as networks facilitating entry of Mexicans in certain occupations, coincide with depressing spillover effects in terms of wages for African-Americans overall.

Looking at the IV coefficient estimates by education level, we note that the results are not statistically significant for African-Americans who have no high school education and those who are high school dropouts, respectively. This is consistent with Card and Lewis (2005), who found that Mexican immigrants have no impact on low-skilled workers who are high school dropouts. Peri and Sparber (2008) argue that this can also be due to task specialization (very low-skilled natives and immigrants are not competing for the same jobs).

By contrast, the coefficient estimate in the IV model is statistically significant for African-Americans with more education, those who are high school graduates, and those with a college-level education or college degree. Mexicans' presence in an occupation coincides with lower wages for African-Americans who are high school graduates but corresponds to higher wages for those with more education.

The table reports the results of J-tests of over-identifying restrictions that verify whether or not both instruments are exogenous. In essence, this tests for the following hypotheses: [7]

H_0: R_{ikt-1} and $TASK_k$ are exogenous (not correlated with the error term);

H_a: R_{ikt-1} and $TASK_k$ or both are not exogenous (correlated with the error term).

[7] The procedure for conducting the J-test involves the following. First we run the IV wage regression with robust standard error and then we retain the residuals. Second, we regress the residuals on the controls and instruments (without the robust option). Third, we test using F-test that the coefficients on the instruments are simultaneously equal to zero. The J-Test is equal to the F-test * number of instruments. Comparing the J-statistic with chi-square distribution with (number of instruments-number of instrumented variables) degrees of freedom, if the J-statistics is smaller than the critical value the hypothesis of exogeneity is accepted. From the J-test, a P-value which is less than 0.05 mean that the null is rejected, and we would conclude that either one or both the instruments are endogenous.

For this test, the P-value should be more than 0.05 in order to reject the null hypothesis that the instruments are correlated with the error terms. As can be seen as per the P-values reported in Table 4, we can reject the null hypothesis that one or both of these instruments are endogenous for the pooled sample and for the subsamples. The one exception is the subsample of the African-Americans who are high school graduates, the result for this group is subject to some concerns that one or both of the instruments may be endogenous (the p-value is less than 0.05). With these caveat in mind, we turn to interpreting the estimates.[8]

Interpreting the Effect of Mexican Immigrants on Occupational Wages

The size of the immigrant flows into a given area or sector must be large enough to have any measurable impact. To have a better idea of the economic significance of the coefficient estimates, we further consider the relative size of the Mexican labor supply in the given occupations for the pooled sample and by education groupings of African-Americans. Table 5 summarizes the results. It reports the average value for the Mexican occupation concentration variable in the occupation of the African-American workers by education group, as well as the computed effect based on the estimates of the OLS model and the IV model.

Recall that the concentration variable is defined for each occupation as the ratio of the percentage of Mexicans in an occupation over the percentage of African-Americans in an occupation/industry. Thus, a value of 1 means that the two groups are equally represented in an occupation; a value of more than 1 means that Mexicans are overrepresented in the occupation; and a value of less than one means that Mexicans are underrepresented in that occupation.

[8] We tried various different functional forms for occupation concentration, and the results are qualitatively similar.

The mean value of the ratio of Mexicans to African-Americans in an occupation for the pooled sample is 1.19. As reported in Table 5, for the IV estimate, for a coefficient estimate of -0.19 for the pooled sample, the implied effect of the relative *overrepresentation* of Mexicans immigrants in the African-Americans' occupations coincides with a 2.3 percent decrease in wages for African-Americans (-0.19*1.19= -0.226).

Now I consider the effect on African-Americans who are high school graduates, for whom we find a statistically significant coefficient of -0.202. The mean value of the ratio of Mexicans to African-Americans in those occupations is 1.34. Again, this value suggests that Mexicans are overrepresented in the occupations in which we find also African-Americans who are high school graduates. Therefore, for the assumed value of -0.202 for the coefficient, the implied effect of the relative *overrepresentation* of Mexican immigrants in the African-Americans' occupations, is a 2.7 percent decrease in wages for African-Americans with a high school diploma (-0.202 * 1.34 = 0.271).

The ratio of Mexicans to African-Americans in the occupations for African-Americans with a college education is 0.75, which suggests Mexicans immigrants are underrepresented in occupations with African-Americans with college degrees. This *lack of presence* of Mexicans in those occupations corresponds to 12 percent higher wages for African-Americans in this group. In other words, the *lack of* presence of Mexicans in jobs of African-Americans with college education appears to mitigate for this group the (negative) effect found for African-Americans with less education. This positive wage association is particularly relevant when we consider the IV model, which instruments with unobserved ethnic skills effect. It is possible that African-Americans who are educated allocate their labor supply into non-predominant Mexican language communicative skills and supervisory jobs in which they earn higher wages. The results suggest

that Mexicans immigrants may serve more as complements in the production process with African-Americans who are more skilled/educated, but work more as substitutes for African-Americans who are lower skilled/less educated.

CONCLUSION

This paper examined whether and by how much Mexican immigrants' occupational composition of employment affects wages of African-Americans in their occupations. The negative OLS and IV estimates suggest that there is an inverse relationship between Mexicans immigrants and African-American wages, which suggests that overall, the higher the proportion of Mexican immigrants is in an occupation, the higher is the tendency for wages to be depressed for workers in those occupations, consistent with the prediction of a crowding out effect in the simple labor market immigration model.

An interesting question we asked is, starting from underlying differences in the occupational distribution profiles of Mexicans and African-Americans, whether divergence in their occupation profile would tend to mute the effect of Mexican immigration on wages. We find some evidence tending to support this for African-Americans who are highly skilled/with more education.

More specifically, we find that the relative supply of Mexican immigrants differs depending on the education skill level. We consider occupation concentration of Mexican immigrants in the occupations of 4 grouping of African-American workers. We confirm that there is some divergence in the labor supply of Mexicans in the occupations in which we find African-Americans with college-level education. Besides this group, there is strong representation of Mexican immigrants in the occupations where we find African-Americans with

less education, especially African-Americans who are high school graduates. The relative overrepresentation of Mexican immigrants in occupations in which we find African-American high school graduates corresponds to lower wages for these African-Americans, which suggest some crowding out effect or substitution effect.

Most of this crowding out effect is relevant only for those who are high school graduates. There are relatively few African-Americans with less than HS school level education, and in spite of the fact that there is representation of Mexicans in their occupations, we found no statistically significant effect on this group of African-Americans. The finding that Mexican immigrants impact tend to be felt more by African-Americans with more medium skill level/who are high school graduate but not necessarily those with less education is consistent with Card and Lewis (2005).

The effect of Mexican immigrants on wages of African-Americans with a high school graduates or those with high skill/college education, are indicative of Mexicans playing complementary roles, as well as substituting. The finding in this paper suggests that the effect of Mexicans is being felt on a broad wage structure and occupational composition of employment for African-Americans.

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TABLE 1

Summary Statistics

Selected Socioeconomic Characteristics

	African-Americans	Mexican Immigrants
Average years of schooling	11.73	6.73
Less than high school	19.4	52.7
High school	35.0	17.4
College graduate	34.1	11.3
Average log hourly wages (1999$)	16.23	13.8
Wage ratio		
Farming		0.82
Service		0.88
Production		0.86
Construction		0.96
Sales/ Office		1.05
Professional		1.26

TABLE 2:

Summary Statistics

Characteristics of Occupations and Occupational Composition of Employment

Socio-economic Index Score	TASK Manual/ Language Index Score	2-Digit Occupation Categories	African-Americans	Mexican Immigrants
61	10.4	Education, Training and Library	5.3	1.3
54	2.93	Management	8.2	2.7
52	2.73	Business, Fin. Operations	3.9	0.9
51	3.2	Computer and Math. Science	2.2	0.3
49	4.3	Life, Physical, Social Science	0.9	0.2
49	4.2	Architecture and Engineering	1.9	0.4
45	2.9	Community and Social Services	1.4	0.4
44	8.2	Arts, Design, Entertainment	1.9	0.6
42	5.1	Legal	1.0	0.1
39	6.6	Sales	11.5	6.1
37	15.1	Protective Services	1.9	0.5
36	7.0	Healthcare	4.2	0.6
33	7.9	Install., Maintenance, Repair	3.9	3.8
30	5.8	Office and Admin Support	15.5	6.9
27	8.3	Construction and Extraction	5.8	14.1
26	6.8	Production	8.8	19.5
24	6.7	Healthcare Support	2.1	1.2
24	30.3	Transp. and Material Moving	6.4	9.8
22	10.4	Personal Care and Service	2.9	2.3
18	14.8	Building and Grounds Cleaning	3.7	11.4
17	11.3	Food Preparation and Serving	5.6	10.1
14	11.1	Farming, Fishing, and Forestry	0.9	6.9

TABLE 3

First Stage

Determinants of Occupation Concentration

	Pooled (1)	Less than HS (2)	High school drop outs (3)	High school (4)	College and more (5)
TASK_fitted	-0.0082	-0.021	-0.0132	-0.0082	0.0030
	(0.0011)	(0.0019)	(0.0012)	(0.0009)	(0.0009)
lag Mexican Occup Concentration	0.0005	0.0009	0.0010	0.0006	0.0002
	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)
Age	-0.1383	-0.004	-0.1075	0.0195	-0.1396
	(0.0062)	(0.0140)	(0.0141)	(0.0055)	(0.0057)
Experience	0.1585	0.023	0.1641		0.1486
	(0.0101)	(0.0229)	(0.0163)		(0.0090)
experience_ square/100	-0.0479	-0.0183	-0.1699	-0.0307	-0.0436
	(0.0206)	(0.0930)	(0.0395)	(0.0239)	(0.0244)
Experience_ cube/1000	0.0029	0.0012	0.0148	-0.0013	0.0043
	(0.0027)	(0.0098)	(0.0048)	(0.0032)	(0.0035)
Maried	-0.0815	-0.1054	-0.0381	-0.1046	0.0192
	(0.0236)	(0.0441)	(0.0547)	(0.0308)	(0.0368)
College	-0.1241				
	(0.0108)				
College degree	-0.1683				
	(0.0200)				
Constant	3.3588	1.757	2.6989		3.3672
	(0.0773)	(0.2695)	(0.2042)		(0.0924)
StateFixed effects	yes	yes	yes	yes	yes
obs	223688	9178	35108	75936	103466
Rsquared	0.0838	0.0272	0.0218	0.0165	0.0364
F-Statistics					
Both instruments	44.47	56.5	62.68	51.98	7.23
Lag Mexican Occup Concentration	10.61	9.62	12.33	12.3	1.35
TASK_fitted	47.86	111.92	81.95	81.95	12.48

Note: Source 1990, 2000 Census 5% sample PUMS.

The dependent variable is the ratio of Mexicans to blacks in each occupation = (Number of Mexican Workers in an Occupation-Industry / Number of Mexican Workers) / (Number of Native African-American workers in an Occupation-Industry / Number of Native African-American Workers).

TASK_fitted is as defined in the test.

Robust standard errors, clustered at the state level.

*** Significantly different from zero at 99 percent confidence.

TABLE 4

Effects of Mexican Immigrants on African-American Male Wages

Estimation Procedure	OLS	IV both instruments	IV lag Mexican occupation concentration	IV task_fitted
	(1)	(2)	(3)	(4)
Pooled Sample				
Mexican occupation concentration	-0.033***	-0.191***	-0.076	-0.233***
	(0.002)	(0.091)	(0.086)	(0.101)
Overidentification J-test		1.9878		
P-value		0.1586		
Less than HS				
Mexican occupation concentration	-0.024***	0.053	-0.285	0.011
	(0.004)	(0.096	(0.235)	(0.009)
Overidentification J-test		1.6932		
P-value		0.1932		
HS dropouts				
Mexican occupation concentration	-0.016***	-0.035	0.049	-0.029
	(0.002)	(0.044)	(0.067	(0.065)
Overidentification J-test		0.0343		
P-value		0.853		
HS graduates				
Mexican occupation concentration	-0.030***	-0.202***	0.075	-0.329***
	(0.002)	(0.013)	(0.091)	(0.127)
Overidentification J-test		9.2307		
P-value		0.0024		
College and more				
Mexican occupation concentration	-0.071***	1.543***	-0.720	1.049***
	(0.016)	(0.670)	(0.874)	(0.305)
Overidentification J-test		2.4077		
P-value		0.1207		

Note:

Each coefficient is from a separate regression that controls for age, experience, experience squared, experience cubed, married, and state fixed effects, (college, post-graduate, in the pulled regression). Dependent Variables log of hourly wages. Full regression results available upon request.

TABLE 5

Relative Size of Mexican llabor supply in The African-American Individual's Occupation

Impact of Mexican immigrants on Wages of African-Americans

		pooled sample		less than high school		high school drop outs		high school		college	
Mexican Occupation Concentration	Mean	1.19		1.97		1.66		1.34		0.75	
	IV	-0.226	***	0.104		-0.058	***	-0.271	***	1.160	***
	OLS	-0.392	***	-0.472	***	-0.027	***	-0.040	***	-0.053	***

APPENDIX A
The Impact of Mexican Immigration on Wages
Dependent variable: log hourly wage
Individual Level Analysis: OLS

	pooled sample		less than high school		high school drop outs		high school		college	
Mexican Occupation Concentration	-0.034	***	-0.024	***	-0.016	***	-0.03	***	-0.066	***
	(0.008)		(0.004)		(0.004)		(0.006)		(0.014)	
age	0.080	***	0.011	*	0.056	***	0.055	***	0.13	***
	(0.005)		(0.006)		(0.005)		(0.003)		(0.008)	
Experience	-0.008	*	0.051	***	0.003				-0.054	***
	(0.005)		(0.013)		(0.006)				(0.008)	
Experience *2/100	-0.220	***	-0.14	***	-0.159	***	-0.144	***	-0.247	***
	(0.011)		(0.050)		(0.018)		(0.014)		(0.013)	
Experience*3/1000	0.024	***	0.012	**	0.016	***	0.014	***	0.027	***
	(0.001)		(0.005)		(0.002)		(0.002)		(0.001)	
bachelor degree	0.019									
	(0.164)									
post bachelor	0.164	***								
	(0.033)									
married	0.149	***	0.123	***	0.134	***	0.16	***	0.145	***
	(0.007)		(0.016)		(0.010)		(0.009)		(0.009)	
constant	0.396	***	0.052	**	0.729	***	0.829	***	-0.496	***
	(0.083)		(0.191)		(0.069)		(0.062)		(0.149)	
R2	0.1885		0.0969		0.1232		0.1172		0.189	
Number of obs.	232523		9413		36011		78505		89774	

Note:

Robust Standard errors in parenthesis. Regression disturbance terms are clustered at the occupation level.

A state of residence fixed effects is included in all the specifications, coefficients not reported

* significantly different from zero at 90 percent confidence

** significantly different from zero at 95 percent confidence

*** significantly different from zero at 99 percent confidence